



**FY 2012 Testimony of the  
ASSOCIATION OF PUBLIC AND LAND-GRANT UNIVERSITIES (A·P·L·U )  
Board on Oceans, Atmosphere, and Climate (BOAC)  
to the House Appropriations Subcommittee on  
Commerce, Justice, Science and Related Agencies (CJS)  
Submitted by Dr. Antonio J. Busalacchi, Dr. Leonard J. Pietrafesa and Dr. Yolande Serra,  
*The A·P·L·U Board on Oceans, Atmosphere, and Climate***

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On behalf of the Association of Public and Land-grant Universities' Board on Oceans, Atmosphere, and Climate, and the national constellation of institutions of higher learning that it represents, I thank you for the opportunity to provide support of and recommendations for the proposed FY 2012 budgets for the National Oceanic and Atmospheric Administration (NOAA), the National Aeronautic and Space Administration (NASA) and the National Science Foundation (NSF). NOAA, NASA and NSF each play unique roles in a number of high-priority U.S. and international initiatives. All three agencies also support research at our member institutions that provides critical information to policymakers and communities across the country. That is why *we strongly support the administration's request of \$5.498 billion for NOAA; \$7.8 billion for NSF; and \$5.016 billion for NASA's Science Account.*

"Although basic science can have colossal economic rewards, they are totally unpredictable. And therefore the rewards cannot be judged by immediate results. Nevertheless, the value of [Michael] Faraday's work today must be higher than the capitalization of all shares on the stock exchange."

--Margaret Thatcher, Speech to the Royal Society, Sept. 27, 1988

"America has been consuming its seed corn: From 1970 to 1995, federal support for research in the physical sciences, as a fraction of gross domestic product, declined 54%; in engineering, 51%. *Annual* federal spending on mathematics, the physical sciences and engineering now equals only the *increase* in health care costs *every nine weeks.* "

-- George F. Will: [\*"Rev the Scientific Engine"\*](#), The Washington Post, January 2, 2011

In the late 1930s, at a time when the federal government did not fund basic research, Alfred Loomis, a wealthy NY industrialist and science geek was the benefactor of basic research pursuits of the world's foremost scientists and mathematicians at his mansion, which was partially converted into a laboratory in Tuxedo Park NY. One of the scientific breakthroughs that he fostered led to the development of microwave radar. Via his cousin, Mr. Simpson, the Sec. of War, Mr. Loomis contacted President Roosevelt who contacted Mr. Churchill. An enormous

mismatch in aircraft and vessel detection capabilities resulted between the Allies and the Axis, and this helped to win the war. This is an example of a basic scientific breakthrough that to great measure is responsible for the position in the world order that the U.S. has enjoyed since WWII.

In 1946, given the radar breakthrough and given the fact that the U.S. did not know when to cross the English Channel to stage D-Day, Congress realized that the nation needed federally funded, weather and ocean related R&D and created the Office of Naval Research; which was so successful that the federally funded National Science Foundation was created in 1949. Subsequently the U.S became the world leader in R&D, its universities and industries became the most advanced in the World and thus the US became the leading economic power of the world. This was not happenstance. This was Congress building enabling capacity for the U.S. economy through the aggressive funding of advanced, innovative research and development. Advances derived from solar, atmospheric, oceanic, hydrologic, environmental, and data and information harvesting have and will drive expansion of the U.S. economic enterprise.

Space weather research and forecasting is a jewel at the NOAA Space Environment Center. Sun storms interfere with the normal operation of communications, can cause large-scale blackouts and could shut down the nation's GPS satellite system and thus the U.S. spatial referencing network. Without research advances in Space Weather, the Nation's military defenses and security, transportation systems, commerce and competitiveness will be severely compromised.

Recently, a NASA scientist developed a new mathematical method to process non-linear and non-stationary data in his basic research and opened up an entire new field of data analysis and information harvesting. He was elected to the U.S. National Academy. However, the scientist has chosen to retire from NASA and has joined a university in Taiwan where the success rate for research proposals is 80 - 90% vs. U.S. rates of 10%. The U.S. has lost a National Academy member to a foreign country because of scarce U.S. research dollars.

While recognizing that difficult budget decisions that must be made for the nation's fiscal health, the President's proposed budget for these three agencies will serve the nation well in advancing science and technology which will subsequently undergird the economy, security and well being of the citizenry of the United States. Outlays in the natural and earth systems' science and technology programs of NOAA, NSF, and NASA will serve to improve and make the nation's surface, air and marine transportation safer and more efficient, advance energy technology, provide the scientific and technological advances to help the defense industry better meet its technology needs, contribute to advances in public health, make the country more resilient to environmental hazards, provide agricultural, energy and transportation sectors with seasonal outlooks, and create the knowledge base upon which society can make wise environmental management decisions. Environmental data collected and distributed by NASA, NSF and NOAA represent a national resource and are used by universities for research, education and outreach and especially by private industry to produce products and services.

Insuring homeland security, maintaining global communications, and informing the public of atmospheric and marine ecological health threats depend upon reliable science. Forecasting the onset, duration and effects of solar storms, atmospheric weather events, coastal storms, sea-level variability, toxic blooms, and seasonal climate conditions are dependent on sustainable growth of

the science and technology that NOAA, NSF and NASA sponsor and conduct. In addition, the FY 2012 budget request will lead to the expansion of the private sector weather and seasonal and annual climate derivatives industry and thus create new jobs.

I next comment on aspects of the agency budgets and needs of the scientific community:

### NOAA

NOAA provides important services to all Americans, services that are vital to our economy, national security, surface, marine and air transportation, human safety and the health of human and marine ecological systems. Extreme weather events, like tornadoes, hurricanes, oppressive heat, heavy precipitation both wet and frozen, dust storms and drought, clearly demonstrate both the immediate and long-term impacts that weather and seasonal climate can have on a region. About \$3 trillion or one-third of the U.S. economy, including industries as diverse as agriculture, finance, energy, insurance, transportation, real estate and outdoor recreation, is highly weather and seasonal-climate sensitive. We support the establishment of the NOAA Climate Service as an economic imperative as private enterprise, public agencies, decision makers and society require seasonal and annual climate outlooks based on solid science.

NOAA's support of environmental research and education via Cooperative Institutes and programs such as the Oceanic & Atmospheric Research's Sea Grant and the Center for Sponsored Coastal Ocean Research are critical to university research, education and outreach. Similarly, NOAA's role in understanding the oceans and coastal areas and oceanic resources under-gird coastal economies.

We do raise a major concern, the need for increased and sustained support of satellite and in situ environmental observing systems. As reported in several prior and recent National Research Council studies, (*Observing Weather and Climate from the Ground Up, a Nationwide Network of Networks*, NRC, 2009), the needs are particularly acute for urbanized areas as well as mountain, ocean and coastal regions. Vertical profiles of variables such as water vapor, winds, and temperatures are virtually non-existent over land and are non-existent over water. Over land, the primary recommendation is for the placement of vertical profilers, vertically pointing radars, acoustic sounders and lidars that collect vertical observations of wind and temperature from the ground up through the lower atmosphere.

For the oceans, the ARGO network needs attention and support as it begins to seriously age. In the case of coastal ocean regions, estuaries and the Great Lakes, a key recommendation is for the build-out and major enhancement of the existing NOAA National Data Buoy Center (NDBC) atmospheric and coastal ocean-observing network and the Joint Polar Satellite System. The data collected are critical to many other NOAA missions, such as understanding supply of larvae of commercially important fisheries and trajectories of oil spills. A national network of profilers would greatly improve skill scores for forecasts, particularly for forecasts of heavy precipitation events and atmospheric chemistry conditions. Likewise, an enhanced and expanded NDBC network would address NOAA's proposed development of an ecological forecasting capability and also will greatly improve the skill scores of forecasting ocean and coastal weather-related phenomena such as precipitation amounts, types and durations of Gulf and Atlantic Nor'easters and West Coast cyclones and rogue waves. Coastal ocean observing, via the existing NDBC

network, is challenged to keep operations at present levels and cannot be enhanced with modern observing sensors without major capitalization.

### NASA

In 2007, the National Academies issued the report, *“Earth and Science Applications from Space: National Imperatives for the Next Decade and Beyond.”* The report found that between 2000 and 2009, funding for Earth Sciences (ES) had fallen substantially. ES research is absolutely critical to understanding climate change, such as the decline of Earth’s ice sheets and the health of the global oceans. For this reason, BOAC is heartened by the Administration’s request for NASA’s expanded and enhanced science mission. Past investments in NASA’s science mission have funded university research that has resulted in the development of new instruments and technologies and in valuable advances in weather forecasting, climate projections, and understanding of Earth ecosystems.

Without the tools developed at NASA or with agency support, oceanic, atmospheric, hydrologic and earth-system scientists and the nation would have only a fragmentary picture of the interconnected functioning of the planet’s oceans, atmosphere and land. The NASA data archive is a treasure trove of environmental information that researchers have come to depend upon. Through its support for young scientists and graduate students, the NASA science mission supports innovation. BOAC supports the NASA budget and applauds the special attention that the White House has paid to the restoration of NASA science.

We also hope that Congress will fund NASA to lead in developing and implementing a scatterometer mission; with fast community access to the data, capability to distinguish between wind and rain and a higher orbit for coverage of Alaskan waters.

### NSF

BOAC supports funding of NSF, which is critical to U.S. basic research. NSF supplies almost two-thirds of all federal funding for university-based, fundamental research in the geosciences. GEO-supported research increases our ability to understand, forecast, and respond to and prepare for environmental events and changes. Through facilities such as the Oceans Observatory Initiative, the Integrated Ocean Drilling Program, and NCAR-Wyoming supercomputer, NSF provides the academic community with advanced capabilities that it would not be able to afford if conducted through individual institutions.

In the President's FY 2012 budget request beyond regular funding of research and related activities, major investments would include \$282.7 million (+\$87.2 million over FY2010/CR FY2011) for the Science, Engineering and Education for Sustainability (SEES) NSF-wide program, \$16 million (first time request) for Cyberinfrastructure Framework for 21st Century Science and Engineering (CIF21), \$10 million (first time request) for Creating a More Disaster Resilient America (CaMRA), \$13 million (-\$1.6 million below FY2010/CR FY2011) for a new Science and Technology Center and \$13.8 million (+\$1.2 million over FY2010/CR FY2011) for CAREER. SEES funding through GEO would focus on clean energy and technologies to help mitigate and adapt to environmental changes. CAREER funds would support young investigators who exemplify the role of teacher-scholars through outstanding research and education.

### **Summary**

Together, NOAA, NASA, and NSF provide critical earth observations and research funding for scientists, engineers and mathematicians working to increase understanding of natural phenomena of economic and human significance. BOAC thanks the Committee for its continued support of these critical agencies.

### ***About A·P·L·U***

A·P·L·U (formerly National Association for State Universities and Land Grant Colleges) is the nation's oldest higher education association. Currently the association has over 200 member institutions located in all fifty states. The Association's overriding mission is to support affordable, high-quality public education through efforts that enhance the capacity of member institutions to perform traditional and innovative roles in teaching, research and public service..

### ***About the Board on Oceans, Atmosphere, and Climate***

The BOA's primary responsibility is to advance research and education in the oceanic/marine and atmospheric sciences through engaging scholars from its member institutions and through a robust federal relations program. The board has approximately 200 regionally distributed members, including some of the nation's most eminent research scientists, chief executive officers of universities, oceanic, atmospheric and hydrologic scientists, academic deans, and directors of Sea Grant programs.

*Thank you for taking time to review our recommendations.*